EP 1048996 translation for IDS

Description OF EP1048996 [ 0001 ] the invention concerns a procedure for estimating the loading and/or the drying duration before expiration of the drying procedure in a household laundry dryer, in which the laundry is brought to the drying process with an air flow in contact and determined with that a variable dependent on the laundry dampness. [ 0002 ] With Haushaltwaeschetrocknern and/or Haushaltwaschtrocknern nowadays in almost all cases the laundry dampness and/or a variable dependent on it is measured and the drying procedure is terminated, as soon as the laundry achieved the residual moisture wished by the control person. The drying duration needed for it depends thereby on many factors, for example on the kind of the laundry, their initial at the beginning, the temperature and the process of the air flow which can be dried, and can be very different therefore. A forecast of the drying duration is difficult for this reason also in particular at the beginning of the drying procedure very. For the control person from the fact the disadvantage develops that it starts and does not know the drying procedure, when it will be terminated, so that it is handicapped in their timing. Additionally a forecast of the drying duration and/or the remainder time straight is particularly difficult at the beginning of the drying procedure, to which this indication for the control person would be most helpful. On the other hand the laundry in the household laundry dryer should not be lie-let also longer time after end of the drying procedure, since in this case the danger of the Knitterbildung exists. The knowledge of the drying duration is therefore from large use. [ 0003 ] A further size substantial for the drying procedure is the loading, which has for example substantial influence on the speed, with which a laundry post be dried can. Further the loading affects also the result of the drying procedure, so that the knowledge of the loading can be used favourably for the controlling of the Haushaltwaeschetrockners. This size is however just like the drying duration only very badly assignable. [ 0004 ] The available invention is the basis the task to create a procedure for estimating the loading and/or the drying duration with which before expiration of the drying procedure and in particular after its beginning reliable statements can be already won already briefly to the loading and/or the drying duration. [ 0005 ] This task is solved according to invention by a procedure for estimating the loading and/or the drying duration with a household laundry dryer before expiration of the drying procedure, with which a variable and a measure for the temperature of an air flow, dependent on the laundry dampness, are determined for the drying process of the laundry before and/or after its contact with the laundry, and which is used by the laundry dampness dependent variable in connection with the measure for the temperature of the air flow before and/or after its contact with the laundry to the estimation of the loading and/or the drying duration. The process of estimation can be repeated during the drying procedure, in order to be able to constantly indicate to the control person a current estimation. [ 0006 ] The solution according to invention is based on the surprising realization that from these inputs the drying duration and the loading are already in particular already briefly after beginning of the drying procedure assignable. [ 0007 ] For the execution of this procedure favourable-proves only the measurement is variable dependent on the laundry dampness and the temperature to one or two places necessarily. Since the laundry dampness or a variable dependent on it is measured anyway for the damp-dependent completion of the drying procedure, this information is already present and requires no additional expenditure. The temperature is a size, which can be measured with very simple and economical means, whereby also the measurement of the air flow temperature is usually anyway accomplished at least at one point for the regulation of heating mechanisms in the household laundry dryer. The inputs can be won therefore at very small expenditure. [ 0008 ] With Abluftrocknern, with which air used for the

drying process of the laundry is constantly sucked in from the outside, it is to be measured favourably, additionally the ambient air temperature and included into the estimation. This temperature can be based by a feeler in the channel for sucking in the ambient air or also by a temperature measurement on any place in the air duct before beginning of the drying procedure and before start-up of the heating mechanism. [ 0009 ] Further additionally the time passed since beginning of the drying procedure can be used for the estimation of the loading and/or the drying duration. In this way the estimation can be improved due to the additional input with repeated estimation during the Trockungsvorgangs. [ 0010 ] In a favourable execution form as variable dependent on the laundry dampness a measure for the electrical resistance of the laundry is determined. This measurement can be accomplished simply by means of electrodes in contact with the laundry and a nowadays usual electrical or electronic control. [ 0011 ] For the evaluation of the inputs for the determination of the estimated values due to the complex relationship between the inputs and the correct estimated values favourable-proves a procedure begun, which was sketched before under evaluation of a row of test datas. In addition can be determined before in a test row by drying procedures both the inputs and the drying duration and the loading and be consulted for the draft of the process of estimation, so that in the enterprise occurrence the appearance both one with the draft combination of the inputs and of it a different the correct or at least to the correct very close coming value for the loading and/or the drying duration already considered later become estimated can. [ 0012 ] As particularly simple possibility a Look UP table can be provided, in that to a multiplicity of different combinations of the inputs the determined, associated values for the loading and/or the drying duration is stored on the basis the before taken up test datas, whereby the estimated values for intermediate values of the input combinations can be determined by inter or extrapolation by neighbouring values from the table. [ 0013 ] Favourable way is determined at the end of a drying procedure the actual drying duration and on the basis these the schaetzfehler for the drying duration estimated before expiration of this drying procedure and considered with future estimations of the drying duration. In this way the procedure in the enterprise learns constantly further and is like that in the situation to consider and compensate changes of the influences substantial for the drying procedure. These influences can be for example a change of the amount of heat for example by aging or by shifting an air duct or the change of the site conditions as for example the ambient temperature or the air humidity. The latters are subject already because of the weather conditions and the seasons to fluctuations. [ 0014 ] The located schaetzfehler can be also used, in order to correct the estimated value already at short notice. In addition the schaetzfehler of the last drying procedure or the averaged schaetzfehler of several preceding drying procedures can be used. If for example with the preceding estimations a biased error were made and later turned out the fact that the estimated value was constantly too low can be added with future estimations the before made schaetzfehler already as a precaution, in order to improve the estimation. This correction of the estimated value is recommended in particular, if the error is systematic and remains similar for some drying procedures at least. Footstep with each drying procedure completely a different one, coincidental error up, can be more favourable it to omit this kind of the correction of the estimations. [ 0015 ] In accordance with a particularly favourable execution form the loading and/or the drying duration become estimated by means of a neural net. In particular a neural net trained by training data can be used. [ 0016 ] Neural nets generally offer the advantage that with them the connection of the inputs with the initial values does not admit exactly as in this case of the estimated drying duration or loading be must. In the opposite it is sufficient, if empirical values are present in the form of training data. It favourable-

proves a neural net used, with which a small number of training data is already sufficient and/or can with that inputs at will on at least one initial value be illustrated. [ 0017 ] Preferred a neural net is used of the type multi Adaline. With a such neural net only few training data records are necessarily to further training favourable-prove. In O. Nelles, LOLIMOT - restaurants, linear models for the identification of nonlinear, dynamic systems, in: Automatic control engineering, Bd. 45 (1997), S. 163 174, R. Oldenbourg publishing house, 1997 is described a such neural net. [ 0018 ] The drying duration actually measured in the enterprise at the end of a drying procedure can be used with a neural net also particularly simply for the improvement of future estimations, since for training by means of training data training rules were used anyway before, with which in same or similar form late values determined in the enterprise be considered can. These values can be used as it were as additional training data. [ 0019 ] The loading and/or the drying duration can become estimated however also by means of Fuzzylogik. This procedure possesses the advantage to require an only small cost of computation. [ 0020 ] As inputs values can be used for all procedures, which are derived from the values for the laundry dampness and the temperature of the air flow before and/or after its contact with the laundry and/or were computed from these. This can be for example the rate of rise, a derivative after the time, the reciprocal value or the average value. Such sizes derived from the laundry dampness and the temperature of the air flow can be used as additional inputs for the estimation or in place of the values, from which they were computed. [ 0021 ] Since the connection between the inputs and the values which can be estimated is very complex, rules can be used for the estimation by means of Fuzzylogik, which were won by learning by means of a neural network from training data. With it the advantage of the adaptability of neural nets can be connected with that of the small cost of computation with the Fuzzylogik. [ 0022 ] Further details, characteristics and advantages of the invention result from the following description of a remark example with reference to the design. In it the only figure shows the signal flow diagram for the evaluation in the procedure according to invention. [ 0023 ] In the design the inputs and/or the input vector are named x. The inputs are the laundry tension that the voltage drop at the laundry with the measurement of the electrical laundry resistance, and the reciprocal value of the rate of rise of the temperature of the air flow are called after its contact with the laundry. These inputs x are determined already briefly according to beginning of the drying procedure and given to a neural net 1, determined from them an estimated value ts for the drying duration. [ 0024 ] Additionally after each drying procedure the actual drying duration TM is measured. From this measured value TM the value estimated for this drying procedure is subtracted ts, in order to determine the schaetzfehler e. This schaetzfehler e is supplied to the neural net 1, itself thereupon it organizes even in such a way that with future estimations of the schaetzfehler e it becomes smaller and/or that the future estimations become better. This error feedback can be achieved by the Backpropagation procedure. [ 0025 ] In order to reach a correction of the estimated drying duration at short notice ts, the schaetzfehler e is passed on additionally at a not-recursive digital filter 2, which smoothes the estimate error process, by for example always forming the average value from a certain number of preceding values, whereby the preceding values of the schaetzfehler can be also differently weighted. The output signal of the digital filter 2 is added to the estimated drying duration ts, in order to improve on the basis the schaetzfehlers e made last the current estimation of the drying duration. The sum TA of the output signal of the digital filter and the estimated value ts is finally indicated, so that after beginning of the drying procedure a reliable value can be communicated to the control person already briefly for the drying duration which

can be expected. ---------- DATA supplied from the DATA cousin esp@cenet - Worldwide

Claims OF EP1048996 1. Procedure to estimating the loading and/or the drying duration (t) with a household laundry dryer before expiration of the drying procedure, with which a variable and a measure for the temperature of an air flow, dependent on the laundry dampness, are determined for the drying process of the laundry before and/or after its contact with the laundry, and which by the laundry dampness dependent variable in connection with the measure for the temperature of the air flow before and/or after its contact with the laundry to the estimation of the loading and/or the drying duration (t) is used. 2. Procedure according to requirement 1, by the fact characterized that for the estimation of the loading and/or the drying duration (t) additionally the time passed since beginning of the drying procedure is used. 3. Procedure according to requirement 1 or 2, by the fact characterized that as variable dependent on the laundry dampness a measure for the electrical resistance laundry is determined. 4. Procedure after one of the requirements 1 to 3, by the fact characterized that at the end of a drying procedure the actual drying duration (TM) is determined and on the basis these the schaetzfehler (E) for the drying duration (ts), estimated before expiration of this drying procedure, and considered with future estimations of the drying duration (t). 5. Procedure after one of the requirements 1 to 4, by the fact characterized that the loading and/or the drying duration become estimated by means of a neural net (1). 6. Procedure according to requirement 5, by the fact characterized that a neural net (1) trained by training data is used. 7. Procedure according to requirement 5 or 6, by the fact characterized that a neural net (1) is used of the type multi Adaline. 8. Procedure after one of the requirements 1 to 4, by the fact characterized that the loading and/or the drying duration become estimated by means of Fuzzylogik. 9. Procedure according to requirement 8, by the fact characterized that for the estimation by means of Fuzzylogik rules are used, which were won by learning by means of a neural network from training data. ---------- ---------- DATA supplied from the DATA cousin esp@cenet - Worldwide

EP 0039645 Translation for IDS

Description of EP0039645 ELECTRONIC SECHE-Linen A PROGRAM MATEUR. The present invention relates to a dryer with revolving drum and electronic programmer, particularly powerful while being very simple to handle for its users. The dryers with revolving drum in which the wet linen, introduced into the revolving drum, is dried by unecirculation of hot air in the drum are already well-known now. Their programming is generally done by traditional electromechanical programmers who determine for example the duration of the drying cycle and/or the percentage of final moisture quel' one wishes to obtain according to whether it is a question of having for example dry linen ready to arrange or linen more or less wet loan with to have passed by again. The dryers where the ordering of the drying cycle would be done only by one choice predetermined of the duration of sèchage itself, Cest-with-statement of the duration of circulation of hot air in the drum would be of course particularly simple to program, but would be far from elaborate and would not lead to a good flexibility of use. More elaborate dryers are well-known < this day, in which the end of the cycle of sèchage itself is ordered starting from a measurement of moisture remaining in the linen, and comparison of this measurement to predetermined values of reference defined by analogical electronic circuits associated to the programmer of dry-linge.Lorsque the programmer was put on a particular position corresponding

to the one of these predetermined values of reference, the signal corresponding to the measurement of moisture remaining in the linen is permanently compared with these values etun electronic in.errupcor, actionnélorsqu' it y acozncidence between the measured value and the value of referencechoisy, interrornpt the sèchage. It is known to carry out measurement del' moisture remaining in the linen by one or the other of both méthodessuivantes. Uneprerniere method consists àmesurer the electric resistance of the linen. For that one runs a weak current through the linen wet between two points isolated from the drum. The resistance of the linen is all the more high as it is drier. A second method consists in measuring the temperature of the outgoing air of the drum. Indeed, this air which enters hot the drum, having been heated beforehand by a heating resistance, cools by the moisture which it takes with the linen and involves with him. Thus, more the outgoing air of the drum is hot, more the linen is dry. It is enough to lay out a thermistor in the circuit of the air to exit and to measure the tension on its terminals to obtain a value indicating the temperature of the air and thus the degree of drying of the linen. It is also known to combine these two methods to obtain a better control of the drying of the linen. The patent application françaisn0 78/27924 deposited le23 September 1978 by the Applicant for a "device of detection of moisture and ordering of a drier àtambour" describes a dryer using this combination of the two methods which has a significant advantage by the fact that the method of measurement of temperature of the air of exit is more interesting for the control of percentages of moisture relatively low corresponding for example to traditional names "dryness" and "ultra-dryness", while the method of measurement of resistance of the linen is more interesting to detect more significant percentages of moisture such as: 5 %, 10 % and 20 % which is traditional values such percentages obtained after drying. In this request for brevetn0 78/27924 had been described and asserted an analogical circuit of detection and despourceiltages measurement of moisture by these two methods and order of the end of the cycle of sèchage when the selected percentage was reached. The present invention relates to a dryer with revolving drum using at least this same combination of the two methods, but by adapting it to electronic programming based on the use of a microprocessor, and by supplementing it and the softener thanks to this electronic programming. It should indeed be noted that if one connait already # washing machines or the crockery with electronic programmer, one does not seem yet to know dryer with electronic programmer. However the techniques of the washing machines and the dryers are very different, just as are to it the parameters entering in line of account for the development of the various programs. Indeed, in the washing machine à laver, quece be the linen or the crockery it be necessary know control some quantity of water and some product of washing to introduce, some temperature of water of washing, some number of revolution detambour...; in a dryer the parameter to control be complétement different since it himself be a question primarily to measure throughout au long du drying the percentage of moisture in the linge.Il result of these difference significant of parameter to utilize intervenir some difference not less significant some means make it possible to carry out the programming electronic, these means be, moreover plus, function, in the present invention, of use combine of two method of According to the present invention, a dryer with drum in which hot air during the drying cycle itself is sent, and using, to determine the percentage of moisture remaining in the linen and to stop, when is reached a selected predetermined percentage, the drying cycle itself, the combination of two methods, namely measurement of the electric resistance of the linen for the programs leading to the highest percentages of moisture and the temperature measurement of the outgoing air of the drum for the the least raised programs succeed auxpou.centages of moisture, is characterized in that it is ordered by an electronic microprocessor programmer receiving

means of selection of programs, a first group of means of selection of programs acting on measuring circuits of the electric resistance of the linen, and a second group of means of selection of programs acting on measuring circuits of the temperature of the outgoing air dutambour, the information delivered by one or the others of these circuits according to whether means of selection of programs of the first or second group were actuated, being used to order the operation of the various bodies of the dryer and to stop the drying cycle properly ditlorsqulest reaches the selected percentage of moisture.The use of an electronic programmer to order a dryer on the basis of this combination of two methods of mesured' moisture allows not only one great flexibility and a great facility of use of the dryer, but still makes it possible to carry out in the course of operation various controls of safety avoiding any risk of excessive and possibly dangerous heating of the linen, these various safety measures being realized in a simple and inexpensive way and being very effective. Other objects, characteristics and results of the invention will arise from the following description given as an example nonrestrictive and illustrated by figuresannexées which represent: - figure 1, a simplified synoptic diagram of the dryer with programming électroniqueconforme with the invention; - figure 2, a diagrammatic representation of the control board and the affichaged' such a dryer; - figure 3, a diagrammatic representation of the principal circuits associésaj microprocessor of the electronic programmer of the dryer according to the invention. One sees on figure 1, in a diagrammatic way, the general organization of the various circuits of the electronic programmer, of the bodies of the dryer which it orders, and of the bodies of detection desdIfférents parameters has to measure or control. Microprocessor 1, parexemple here a microprocessor S 2000 FRIEND, comprises a memory morteRON1 in which information is définivement stored forming the various programs which the dryer is suitable for realize on request of the user actuating the means of selection, of the keys for example, at its disposal on the control cluster 2 of the table of the dryer. This microprocessor comprises moreover a read-write memory RAM where are temporarily stored data tempo raires such as the choices carried out paroperator at the beginning of the drying cycle. Microprocessor 1, as well as the various electro circuits screw which are associated are classically fed for him, starting from sector 3, by a tension continues + Vcc (+ 9 volts for example) obtained by means of a transformer 4 follow-up of a circuit of rectification 5, then of a circuit of filtering 6 and a regulation 7. The tension + Vcc still feeds a circuit 9, ' of "reset" which are intended to give to zero the whole of memories RAM in the event of cut of the sector of duration higher than one second approximately and at the moment of the powering of the apparatus. This circuit of reset is thus a circuit of initialization (at the time of the powering) or of rebootstrapping (after a short cut), and makes it possible to prevent that parasitic changes of states of certain logic elements of the microprocessor do not come to distort the operations. It can be for example réaliséconformément with the circuit of the patent application françaisn0 79/09489 deposited on April 13, 1979 by the Applicant. A clock 10 and one synchronising circuit secteurll in addition make it possible microprocessor 1 to function suitably, as it is well-known of the expert; synchronization sector delivers a signal which is used as impulse of clocking with the management of times, of the multiplexing of the afficheurs(LED) and of the control cluster of the control board. Microprocessor 1 orders, starting from data coming on the one hand control cluster 2 and on the other hand circuits from interface measuring, as it will be explained further, the various parameters of drying, the various bodies ensuring drying. These bodies are notammentla resistance 13 of heating of the air, the ventilator 14 sending the air through the drum containing the linen, the engine 15 turning alternatively in a direction (+) and the other (-) and driving the pulley in rotation around its axis These three bodies are ordered for

example by four relays 16 (for resistance, for the ventilator, and for each direction of rotation of the engine) them same ordered by the intermediary of a power circuit 17. The microprocesseur1 order moreover posting on table 2, for example by electroluminescent diodes LED, of a certain number of information like possibly the operation of an aural signal thanks to a bell 18. The information used by lescircuits of interface 12 so that microprocessor 1 can carry out various controls of which it has the load is: the températureff E of the air entering the drum; the températureO S of the outgoing air of the drum; resistance RL of the linen in treatment; the microswitch of door 19. This microswitch of door 19, which can be directly connected besides to the microprocessor without passing parl' interface 12, ensures in the event of opening of the door of the dryer an instantaneous stop of all the bodies: engine, ventilator, heating. But the program remains in the état;ctest-with-statement that with the closing of the door the program continues where it was with the opening. Figure 2 quireprésen5:e trèsschématiqoement an example of the various elements which can be on the table of commanded' a dryer according to the invention will make it possible to include/understand, in connection with figure 1, the general operation of such a dryer. This table 20 comprises dune leaves the keys which constitute the means of selection of the programs, and in addition bill-posters, either choices carried out, or some autresirllorma- tions; these bill-posters are here LED represented by small circles. An on/off key (MA) 21 met the machine under tension. A key 22 makes it possible, when it is inserted, to neutralize the bell. A whole of keys 23 makes it possible to choose programs of drying whose common characteristic is to be controlled by a measurement of the percentage of moisture remaining in the linen. A first group 24 of this whole of keys 23 corresponds to the strength check of the linen; three keys make it possible for example respectively to reach a residual moisture of 20 %, 10 % and 5 %. the second group 25 of this 23correspond unit to the control of the te#mpérature Go de Pair outgoing of the S drum; two keys make it possible for example respectively to reach what is called usually "dryness" S(0 % of moisture: and "US ultra-dryness" (< 0 % of moisture). A fast definition is given here these différentesexpres- sions and percentages. Sil' one considers a load of dry linen (before washing) of 5 kg, this load will weigh, after washing 5 + N kg = N kg It is this load of N kg which is introduced into the dryer. A drying on the position "dryness" will eliminate the eaujusqu' a' what the load returns roughly to its 5 kg of before washing. A drying on the position "ultra-dryness" will make him lose part of the moisture (taken in the atmosphere) which contained 5 kg of linen before washing, a drying on positions 5, 10 or 20 % will make lose with the load of N kg a weight such as the quantity of free water either equalizes to 5, 10 or 20 % of the weight of the load of dry linen (or 5 kg in the example considered). The cycle of operation of the dryer dont' one of the five keys of this unit 23 was selected and inserted is as follows. As long as the percentage of residual moisture selected is not reached, the microprocessor orders the alternate rotation of the drum in the draught heated by resistance. A permanent safety functions, it consists in measuring the temperature of the air at the entry of the drum and stopping the heating if it exceeds a predetermined set point. Lorsquel' one or the other of the circuits of interface 12 (according to whether the inserted key corresponds àl' one or the other of two groups 24 and 25) indicates to the microprocessor that the selected value is reached, the microprocessor orders the stop of the food of resistance 13 of heating of the air. The drying cycle itself is finished. Then begin the cycle of cooling of the linen, clas sic in itself in the dryers with drum. The ventilator sends in the drum which continues to turn of the air not heated during for example 10 mn. Three bill-posters 26, 27 and 28 of the dashboard indicate in turn the time of the cycle of cooling which still remains to be run out. First diode 26 ignites at the beginning of this cycle (10 mn), the second at

the end of 5 mn, indicating that there remain 5 mn and the third at the end of 10 mn indicating that the cycle of cooling is finished. Are then lit, diode 28 and the diode of the unit 23 correspondent to the program of drying which was selected. When the cycle of cooling is finished, the microprocessor orders the stopping of the drier and release a short moment, aural signal 18, except if the key 22 which orders its suppression were actuated beforehand. In a preferred realization of the dryer, the cycle known as starts then of "défroissage" which will last a sufficient time so that the user comes arrêterle - dryer and to leave the linen it without this one being ànouveau ruffled Indeed, if lingeattendait it to have left the dryer whereas the drum would be motionless, it would be all the more ruffled as there would have remained longer motionless and in heap at the bottom of the drum. This cycledè défroissage where the only body under operation is the engine (ventilator and resistance not being fed) does not avoid this disadvantage as long as it continues. A good example of possible duration dudéfroissage is one hour, the bell (if it were not cut) functioning for example all the 2 mn to inform the user who the linen is ready. One still sees on figure 2 a 28' unit of, 7 associated keys and 7 LED. This unit, and its corresponding orders, is not indispensable.I1 is in a realization of the sèchelinge where, according to a particularly simple method, the drying cycle itself is ordered by a timer. In other words the time of drying is # fixe.Toutes the 5 mn the diode corresponding to time remaining to be covered ignites; the preceding one dies out In a general way the electronic programmer is such as when a program of drying was chosen by actuation of one of the keys of the unit the 23 control of the end of the drying cycle itself is done by measurement and sending with the microprocessor of the only measurement corresponding to the percentage of residual moisture selected, i.e. by controlling one parameter and without controlling the various stages successively corresponding to the intermediate percentages. This is true with an exception close # in a preferred realization. Into effetlorsque the programme"sec "or" ultra-dryness "was selected and that the drum contains little linen, the temperature of exit E S can be sufficiently high to correspond to the set point of this program, without the soitsuffisant linen lying dry. To avoid that, the program corresponding au"sec "or to" ultra-dryness "comprises an automatic checking of passage by the measurement of the resistance of the linen corresponding to 5 % of residual moisture. As long as resistance will not be paspassée by this value, a tempéature de9 S sufficiently high will not stop the heating. In addition, just as there is a general safety on the temperature of entréeG O there exists one about it on the temperature of E' left I S. The latter consists in fact to leave the program always connected "ultra-dryness". Thus, as soon as the temperature of exit exceeds valeurcorrespondant it àl"' ul.tra-dryness (of the order de80 C), that this program has, or not, selected, the heating is stopped etl' one passes to the cycle of cooling. Finally it is possible to provide that a test program of the dryer, with the use for example of the after-sales services, seraenclenché by a known coded ordering of this only service and not of the usual user. This coded order can be for example the simultaneous actuation of at least two keys. It should be noted that apart from this possibility, the interlocking of a key corresponding to a program of drying prohibits the interlocking ensuited' another, as long as the first was not pasterminé, etceci to avoid wrong movements. Figure 3 represents more in detail the circuits of interface 12prélevant information @ SX E and RL on detectors of these sizes and transforming them into information usable by microprocessor 1 to order the stop of the heating, i.e. the stop of the cycle of heating itself either when the set point is reached corresponding to the program chosen, or when a defect of a detector or a circuit would be likely to cause an even dangerous abnormal heating linen. This interface 12 can be functionally divided into three circuits. A first circuit 31 makes it possible to measure electric resistance duSinge RL to chaquetour of tainbour,

this résistance.R1 of being plusenlevée as much than the linen is drier. This circuit delivers with the microprocessor, enI2 a logical signal function of what the value of selected residual moisture is, or is not reached. A second circuit 32 makes it possible to measure on the one hand latempérature 9 O of entry of the air in the drum and its E ture 0 S of exit moderated. These two measurements are done by means of thermis tances with negative temperature coefficient (CTN), i.e. whose resistance decreases when the temperature increases. Microprocessor 1 used iciétant able to carry out analogical comparisons of values, the measurement of the set points is done by comparison of the analogical values elaborate in lecircuit 32 and delivered in K1 and K2 with the microprocessor with a reference voltage standard K réfelle-même applied to the microprocessor. A third circuit 33 participant partly àl' one and in the other of circuits 31 and 32 makes it possible to realize periodically, all second # for example, on request of the microprocessor by the connexionAg, a certain number of checks and controls. Circuit 31 having to compare the value of resistance RL to each turn of drum with one or the other of three set points (5 %, IQ %, 20 % of residual moisture for example), one regularly takes comparative measurements with a certain number (three in this example) of bridges of reference put in series by the transistors T1, T2, which constitute switches ordered respectively by the exits A7 etA8 of the microprocessor, according to the program posted on the control cluster 2. When the A7 exits and A8 of the microprocessor are on the level bastA7 = 0, A8 =) the set point is for example 5 %;lorsque A7 = 0 etA8 = 1 (high level), it is from example 10% ~ when A7~ 1 etA8 = 0, it is for example 20 %, these values depending of course on the values of various resistances forming the resistive bridges to which participeRL. As of quel' one presses on a key of selection of moisture unprogramme of drying is selected. The sortieAg dumicroproP cessor sends to the T5 transistor of the control and safety circuit 33, all the secndes, a high level (A9 = 1). The T5 transistor is then saturated during a short moment during which it simulates the passage of a wet load of linen between the electrodes of measurement of moisture: the microprocessor receives then from 32 a logical signal (dontPelaboration is explained below) which makes it possible to test circuit 31 regularly. When the drum turns, the mesurehumidity by measurement of real resistance RL is carried out at the rate/rhythm of its rotation, every second approximately. Each time the electrodes sont"en the air ", transistor T3 is blocked; the T4 transistor is aussiet the C1 condenser is charged under # Vcc. All the times that the linen to be dried falls down between the two electrodes, a certain resistance RL is measured depending on the state of the linen. Led transistor T3 and offers a unloading circuit to the C1 condenser by R40 resistance and the D41 diode. Led the T4 transistor and provides logical information sur12. This entrée12 is tested all the fiftieth ones of second by the microprocesseur.Si no information is not provided to the microprocessor during I at 2 minutes for example, one considers that the degree of selected drying is reached; a certain duration of the vérifica#tion of the absence of information is necessary to avoid the harmful effect of parasites. Circuit 32 carries out the measurement of temperatures # S and # E simultaneously, on request of the A10 exit of the microprocessor, and this, while the sortieAg is on the bottom grade. Indeed, lorsqueAg = 0, the T6 transistor is blocked so that the T7 transistors and T8 are saturated and short-circuit high resistances that sontR50 and R51. When the A10 exit of the microprocessor requires the measurement of the potentials of points A and B representative of the values of # S etO E' these measurements are done suitably through the transistorsT9 and T10 saturated. The values corresponding to temperatures # E and # S of entry and exit vement appear respecti- E S then in K1 and K2 on entries of the microprocessor. They are compared there with the Kréf value worked out by the bridge of resistances R52, R53. The set point of @ E ', which is used as safety, is safety, of

instruction of value # E, as which serves is always the same one. The set point of # S takes one or the other of two values according to quel' one selected the "dry" program or "ultra-dryness"; these two values are obtained by bridges of resistances whose choice is done on request of the A12 exit of the microprocessor (A12 = O or A12 = 1). Finally the control 33 and safety circuit allows, when its entry (sortieA9 microprocessor) is at the high level (A9 = 1) to make several checks. It not only allows, to check circuit 31, but still to check the temperature sensors S and E Indeed lorsqueAg = 1 led the T6 transistor; the transistors T7 and T8 are blocked. RésistancesR50 and R51 of ohmic value high in front of the value of the other elements, of which thermistors, with which they are in series between +Vcc and the mass make considerably assemble the potential of points A and B. If the thermistors measuring 8 S and 9 E are suitably S E connected, this significant rise of potential appears on the K1 entries and K2 of the Si microprocessor on the other hand, by accident one or the other of the two thermistors is badly connected, its resistance is too high so that these potentials rise the microprocessor orders the passage in phase then refroidisserment. One can still note that for an anomaly such as one of the two thermistors is in short-circuit, the passage in cycle of cooling is done automatically without intervening the control 33 and safety circuit. Indeed a thermistor in short-circuit corresponds for the microprocessor to a temperature @ E or 9o audessus of the set points of the various E S programs, whatever they are, and the microprocessor compares this information to an end of the drying cycle. One saw, throughout the description which has been just made how the use of an electronic programmer gave flexibility to the operation of a dryer and made it possible to benefit from the combination of several methods of measurement of residual moisture in the linen. Supplied from the esp@cenet database - Worldwide dated

Claims of EP0039645 CLAIMS 1. Dryer with revolving drum in which is sent to dePair hot during the drying cycle itself, and using, to determine the percentage of moisture remaining in the linen and to stop, when is reached a predetermined percentage, the drying cycle itself, combination of two methods, namely measurement of the electric resistance (RL) of the linen for the aboutissantaux programs percentages of moisture more élevéset the temperature measurement (19OS? outgoing air of the drum for the programs leading to the the least raised percentages of moisture, characterized in that it is ordered by an electronic microprocessor programmer (1) receva#nt of the orders of at least two groups of means of selection of programs, a first groups (24) of means of selection of programs acting on circuits (31) of measurement of the electric resistance (RL) of the linen, and a second groups (25) of means of selection of programs acting on descircuits of measurement of the température(9 a) of the outgoing air of the drum, information (12; K1 J 2 > delivered by one or the others of these circuits according to whether were actuated average the desélection of programs of premier(2tus) or the second (25) groups, being used to order tionnement sinks it various bodies (13, 14, iS) séche-lingeet to stop the drying cycle itself when is reached the selected percentage of moisture. 2. Séche-linen according to claim 1, characterized in that it comprises a third group (28 ') of means of selection of programs of drying acting on means of timer such as the duration of the drying cycle itself fixed and is predetermined by the choice of the actuated means of selection. 3. Dryer according to the claim 1 or 2, characterized in that it comprises a cycle of cooling automatically engaged as of the end of the cycle of séchagëproprement known as, this end of the drying cycle ordering the setting out-circuit of the means of chauf fage of the air circulating in the drum and letting this air circulate in the drum in rotation for one predetermined length of time which is the duration of the cycle of cooling. 4. Dryer according to claim 3, characterized in that witnesses (26, 27, 28),

such as electroluminescent diodes (LED), are activated a short moment with intervals of predetermined times of the cycle of cooling, indicating the time which remains to be run out until the end of this cycle where the linen is ready to have left the dryer, one of these witnesses being activated at the end of this cycle. 5. Dryer according to one of claims 3 ou4, - caracté- rized in what the cycle of cooling is followed of a cycle known as of "défroissage" during which the linen, ready to have left as of the end of the cycle refroidisssement, continuous to turn in the drum in rotation, means of ventilation (14) having been mishorscircuit as of the end of the cycle of cooling, this cycle dedéfroissage avoiding with the linen of refroisser while waiting for its exit of the sèchelinge. 6. Dryer according to claim 5, characterized in this qutà of the predetermined regular moments of the cycle dedéfroissage, unsignal sound (18) is actuated, warning the user who the linen is ready. 7. Dryer according to claim 6, characterized in that the operation of the aural signal (18) can nement be inhibited paraction key (22) of the control cluster (2) of the dryer. 8. Dryer according to any of the revendicationsprece cog, characterized in that the means of selection of the various groups (24, 25, 28 ') of selection of programs of drying consist of keys laid out on the control board (2) dusèche-finge, are associated to luminous witnesses such as electroluminescent diodes (LED) and are connected to the microprocessor (1) container, in dead memories (ROM), the various programs of drying likely to be selected. 9. Dryer according to any of claims 3 to 8, characterized in that it comprises a general safety consisting in regularly comparing the information of the temperature < E S) of the outgoing hot air of the drum with the maximum set point corresponding to the driest program (ultra-dryness), even if another program of drying were selected, and to pass automatically to the cycle of cooling if the value of cettetempe rature(0 O #) exceeds # set point of this program ultrasec. 10 Dryer according to any of claims 3 to 9, characterized in that it comprises moreover deprélè- means vement of the temperature < E E) del' hot air entering the drum, and of the means to compare this temperature with a predetermined set point, the going beyond of this set point causing the automatic passage in cycle of cooling. 11 Dryer according to one quelconquedes preceding re!endications, characterized in that, when one of the programs of the second groups (25) of the means of selection of programs was selected, the drying cycle itself is stopped when estatteinte the temperature G O of outgoing Par of the drum corres S laying with the set point of the selected program, if and only if it were noted that the electric resistance of the linen had passed by the set point corresponding to the driest program of the first groups (24) of the means of selection of program. 12 Dryer according to any of the preceding claims, characterized in that it comprises a test program of bonfonctionnement dryer, this test program being started by an order codéeconsistant sirnultanément to actuate at least two predetermined means of selection of program. 13 Dryer according to any of the revendicationspre cédentes, characterized in that its electronic programmer comprises, organized around a microprocessor (1) with built-in memories supplied with also known way, feeding circuits (3, 4, 5, 6, 7) traditional in themselves and ordered in oneself, clock (10), circuit (11) of synchronization sector and circuit (9) of initialization or rebootstrapping (reset):: - a table (2) comprising the various groups of means of selection of programs, and luminous witnesses, as well as an on/off key (21); - means of detection of the température(has < O E) air entering the drum, of température(# S) of the outgoing air of the drum and the electric resistance (RL) of the linen; - of circuits(12) of interface between these means of détection(# E' G # RL) and the microprocessor;; - a circuit (17) receiving the instructions which the microprocessor transmits to the bodies of the dryer ensuring the drying-engine (15) of drive dutambour, ventilator (14), means (13) of heating of the ventilated air - and treating them to make them usable by the means of order (16) of these

various bodies. 14 Dryer according to claim 13, characterized in that it comprises moreover means (18) of production of an aural signal at predetermined moments of the program in the course of unfolding, and a touchedtinhibition of this aural signal laid out on table (2). 15 Dryer according to the claim 13 or 14, characterized in that the circuits of interface (12) comprise: - a first circuit (31) of measurement of the resistance (RL) of the linen by electrodes laid out in the turning drum, put in circuit by the first groups (24) of means of selection of programs, this first circuit (31) delivering with one entrée(I2) - dumicroproces -- sor (i) caracterisic une#rformation of the value of this resistance - a second circuit (32) of measurement temperature (# E) of the air entering the drum and the temperature (6 S) of the outgoing air of the drum, by thermistors respectively laid out on the entering and outgoing passage of air of the drum, put in circuit, in particular, by (25) of means of selection of programs, this deuxièmecircuit (32) delivering at entries (K1, K2) of the microprocessor (1) of information characteristic of the values of these temperatures; - a third circuit (33), taking part partly in the two first (31 and 32), allowing to realize, on request of the microprocessor, the checks of correct operation of the first (31) and second 132) circuits. 16 Dryer according to claim 15, characterized in that the first circuit (31) descircuits of interface (12) comprises as many resistive bridges incorporating resistance < RL) linen than the first groups (24) of means of selection of program has possible choices, actuation del' one or the other of these means of selection of the first groups (24) commander, through the microprocessor (1) commutation del' one or the other of these resistive bridges so as to compare the resistance of the linen with the corresponding set point; the signal resulting from this comparison (point C) is formatted by a circuit at transistors (T3, T4) and condenser (C1) to give on entrée(12). microprocessor (1) a logical signal indicating that the selected set point is, or, is not reached. 17 Dryer according to larevenciiciotion 15 ouig, characterized in that the microprocessor (1) stops the drying cycle itself only when it checked during a predetermined time that the predetermined set point was reached, this time being sufficient to avoid the taking into account of information due to parasites. 18 Dryer according to claim 15, characterized in that the second circuit (32) of the circuits of interface (12) comprises a resistive bridge incorporating the thermistor of temperature measurement of entry < E "and as many resistive bridges incorporantla thermistance#de measurement temperature of exit (Q O #) that the second groups (25) of means of selection of programs has possible choices, the actuation of one or the other of these means of selection of the second groups (25) commander, through the microprocessor (I) commutation del' one or the other of these resistive bridges so as to compare the température(0 S) of the air of exit with 19 Dryers according to claim 18, characterized in that, the microprocessor (1) used comprising a circuit comparator of analogical values, the values characteristic of the temperatures of entrée(0 E) and exit (G O #) of the air, are applied in analogical form to entries (K1 and K2) of the microprocessor where they are compared with a reference voltage standard (K réf) itself applied to another entry of the microprocessor. 20 Dryer according to claim 19, characterized in that the application to the entries (K1 and K2) of the microprocessor (1) of the signals representing the values of the inlet temperatures (O OE) and desortie(8~ (points A and B) is made on ordering of a sortie(A1 microprocessor which makes conducting two transistorsIT and T10) interruptory whose exits are respectively connected to known as the entrées(K1 and K2) of the microprocessor. 21 Dryers according to the whole of claims 15 to 20, characterized in that the third circuit (33) of the circuits of interface (12) functions in checking circuit of the first (31) and second (32) circuits of the circuits of interface (12) at moments oùceux-Cl do not deliver with the microprocesseur(î) information which they measure, this operation in checking circuit of the third circuit (33) being done on

request for an exit (A9) of the microprocessor (1) and consistent:: - on the one hand to check the first circuit (31) by freeing a transistor (T5) interruptory simulating a very low value of resistance of linen (RL); - in addition to check that the thermistors of the second circuit (32) are suitably connected while coming to put in circuit in the bridges of resistances containing these two thermistors two resistances (R50 etR51 > of high value connected in parallel on two transistors (T7 and T8) conducting during real measurements of the thermistors and blocked during these measurements of control by the troisièmecircuit (3#3); the setting in circuit of these resistances of high value appreciably increases the potential of the points of measurement (A and B) and of the signals applied to the entries (K1 and K2) of the microprocessor if the thermistors are suitably connected; so on the other hand these thermistors present. a defect of connection comparing them one or the other to an open circuit, the setting in circuit of both résistances(R50 etR51) of high value leaves the potentials of these points of measurement (A and B) practically unchanged; - in the case dune failure noted by the microprocessor surl' one or the other of the first (31) and second (32) circuits on this action of the third (33) circuit, the microprocessor stops the drying cycle itself. Supplied from the esp@cenet database - Worldwide dated

Description OF DE19939273 the invention concerns a procedure for determining the prospective drying duration in Kondensationswaeschetrocknern well-known design with a continuous temperature collection at the drum in and drum withdrawal and with a humidity-dependent control. As well known the ideal process cycle of the drying procedure and thus the drying duration of the laundry in a laundry dryer are determined predominantly by the characteristics of quantity, dampness and kind of textile of the loading, device-specific characteristic data of the Trockners, among other things the amount of heat, as well as the condition of the ambient air, thus air temperature and the relative humidity. Past procedures for the determination of the drying duration or loading proceed generally from a causal connection only one measured variable to the goal sizes. Thus the system is to be determined under and thus the loading and the drying duration not sufficiently exactly. From the DE 30 30 864 C2 already a procedure for automatic steering of the drying procedure up to reaching a desired drying level is well-known, with which the gradient of the rising temperature is determined during an early phase of the drying procedure and as a function of this the necessary actual working time is calculated. To receive felt with a such procedure it as particularly unfavorably that with the determination of the heat-up speed the temperature difference between washing drying system and ambient air must be considered, in order representative a result of measurement for the necessary actual working time. If one is limited with the given procedures alone to the determination of the heat-up speed, enviromental influences, like for example the initial test temperature of the laundry, become which does not consider initial test temperature of the laundry dryer system and the ambient temperature, so that an inaccurate current value for the necessary actual working time is given to the program expensive mechanism. In addition an inaccurate value is determined also with line voltage changes, since the heat-up speed is dependent on the amount of heat and the mains voltage enters squarely amount of heat. A further disadvantage consists of the fact that by the heating-up time a relatively late Erstanzeige is only made possible after 10 min. Further it is well-known from the DE 40 13 543 A1 to determine the remaining duration of a drying procedure after reaching a given target temperature as a function of the cooling speed in the drying system. Here also the disadvantage exists that the announcement of the duration takes place only at a relatively late time after switching on of the equipment on. From the DE 44 42 250 A1 is well-known a procedure for intending the prospective drying time in a laundry dryer,

with which for as error free a determining of the drying time as possible independently of external influences to determine and in relationship to set like for example variable ambient temperatures, is intended, during drying a part or the entire heating mechanism to each other periodically switch on and off, the differences on the one hand between the exhaust air and the supply air temperature and on the other hand between the exhaust air temperature and the air temperature before entrance into the heating mechanism from periodically measured temperature levels at the indicated places and the verhaeltniswerte with empirical values to compare and therefore on the respective applicable drying duration conclude. The expenditure of computer achievements, necessary with this control procedure, is however substantial, it can thereby in addition the large spread be only partially limited. These disadvantages are decreased in accordance with DE 44 32 055 A1, by for the faster announcement of the duration of the drying procedure the resistance of the laundry which can be dried using an actually well-known device for the measurement of the residual moisture content at an early time of the drying procedure are determined and signaled as a function of the determined resistance value a current value in an indicator, put down in a non volatile memory. Further a procedure for the remainder damp control of a Waeschetrockners is using a conductance-dependent humidity meter circuit admits become from the DE 34 17 482 A1, with which during that approximately conductance-constant drying phase in the humidity meter circuit the tension resting presently/immediately against the laundry resistance is measured as indicator for the available conductance and/or as indicator of the respective loading quantity and/or kind of laundry and supplied to a correction stage. In the correction stage the comparison of the momentary value with empirically determined and in a memory of the correction stage takes place put down reference values. In dependence of this comparison those the preselected residual moisture content adapted cutoff voltage is adjusted in each case for the completion of the drying time. Also with this procedure no sufficiently exact forecast is made possible for the drying duration, since changing messbedingungen, for example the change of the water quality, to recognize each other and process not let. The reason for this is the indistinct correlation between laundry resistance and/or laundry conductance and the wassermasse of the drum loading. Finally a procedure for the determination and announcement of the running time of a drying procedure is well-known with a program controlled laundry dryer to make with over the user as exact an overview as possible possible over the time of the prospective end of a drying program running off from the DE 197 05 585 A1 by an accumulation of dry-degree-dependent current values put down by in the program expensive mechanism for different drying programs a first estimated value is calculated for the program execution time of the selected drying program and brought to the announcement. Also this procedure does not permit determination of a sufficiently exact forecast of the drying duration. The used measured variables for the determination and announcement of the running time of a drying procedure are so far either the electrical resistance and/or the conductance of the laundry or the temporal temperature gradient in the dryer, the kind of textile thereby by the user by adjusting at the control elements are given. The invention is the basis the task to determine and achieve the necessary drying time of the laundry in Kondensationswaeschetrocknern more exactly by actually well-known measured variables at the beginning of the drying process that by a suitable learning algorithm the forecast of the drying time can be constantly corrected. This task is solved according to invention by a procedure with the characteristics indicated in the principal claim. The advantage of the procedure according to invention is to be seen in particular in the fact that an exact regulation is made possible for the drying duration as a function of the loading and these by a learning algorithm with consideration of the material occurring drying times be

corrected can. By the procedure according to invention thereby a substantially more exact conclusion succeeds to the drum filling on the wassermasse mHÒ and/or on the drying duration under elimination of the unknown dry weight of the laundry mwaesch. At least two actually well-known, to a large extent independent measured variables become according to invention, for example the more exact determination of the drying duration of a Kondensationswaeschetrockners as promptly as possible after the start of the equipment: to first the electrical resistance/conductance of the laundry at the beginning of the drying process as well as mathematical/physically the sizes, for example the electrical tension Uw over the laundry resistance, in particular the arithmetic average value Uw of this tension Uw and to second the temporal temperature gradient at the drum withdrawal of the processing air after switching on of the heating on as well as the sizes, for example reciprocal value of the temperature rise and temperature time constant of the system, mathematical/physically derivable from it, in particular in addition, Temperaturdifferenz/der temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating, derivable from it, maximum Temperaturdifferenz/der on maximum temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum withdrawal of the processing air with a given firm temperature difference to Drum entrance after switching on of the heating, the temperature gradient on at the drum withdrawal of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating on, uses and with one another in correlation set, so that a substantially improved drying continuous estimation tprognose results. The moreover for the optional consideration of the amount of heat (Pheiz) of the Trockners the temporal temperature gradient at the drum entrance of the processing air after switching on of the heating on as well as the sizes, for example reciprocal value of the temperature rise at the drum entrance, mathematical/physically derivable from it, are used in particular in addition, Temperaturdifferenz/der temperature rise at the drum entrance of the processing air in a firm period after switching on of the heating, the maximum temperature rise on at the drum entrance of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum entrance of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating, the temperature gradient on at the drum entrance of the processing air with a given firm temperature difference at the drum entrance after switching on of the heating on, and with before measured variables mentioned in correlation set. The procedure according to invention concerns mentioned just as above measured variables, if they are subjected with a similar or digital filter. According to invention the forecast accuracy of the drying duration substantially improved with the procedure arises as a result of the fact that n measured variables are brought with one another at least according to it the contained physical connections to the n main measured variables in relationship. A remark example of the invention is below described. The procedure according to invention used at least two actually admitted measured variables, from which each individual no clear conclusion permits on the drying duration, because they depend also in each case on the unknown composition of the drum loading. For the first measured variable thereby the electrical laundry conductance G can be consulted, which the damp laundry between appropriate electrodes arranged in the drum trains, and/or which thereby by means of a meter circuit caused tension. As the second measured variable for example the temperature gradient D can theta/dt the drum output temperature theta to serve, which after switching on of the heating on adjusts itself. Both measured variables depend on the wassermasse mHÒ the drum filling, them become however likewise by the dry

weight of the laundry mwaesch, i.e. affects by the kind of the distribution of the water in the drum loading. Thus each measured variable for itself permits alone only a very inaccurate conclusion on the wassermasse and thus on the drying duration. By the procedure according to invention now a substantially more exact conclusion succeeds to the unknown dry weight on the wassermasse and/or on the drying duration under elimination. This is made possible on the one hand by the fact that the vector of the inputs, i.e. the measured variables, an initial value, which is assigned prospective drying duration. This allocation is won from a multiplicity of accomplished rehearsing skirt now gene with different loadings. In addition, on the other hand an analytic connection between the vector of the measured variables and the forecast size can be found. The second possibility possesses the advantage that an analytic expression in the dryer which can be realized is to be handled easier. For the search for an analytic expression one proceeds as follows: The diagram of the measured values from the test drying as a function of the wassermasse and/or the drying duration results in curve families. The individual curves can be differentiated thereby by a loading parameter, for example by the dry weight or by the dampness. Due to the fragmentation in curve families there is thus no clear allocation between the measured value and the forecast value. If now during the representation of the measured values auxiliary variables will use, which are corrected with the loading parameter, for example the dry weight or the dampness, succeeds, combining the curve families in each case to a to a large extent closed curve which points clearly to the forecast value. Now a set of equations, which can be dissolved under elimination of the loading parameter used for the correction after the forecast size, supplies the mathematical formulations of dependence with the auxiliary variables on the forecast size. It shows up from the test drying that, for example, the following relations can be formulated: (D theta/dt)<-1 > = k0 + k1.(mHÒ + 0,35.mwaesch) (Gl. 1) G.mwaesch = k2 + k3.mHÒ (Gl. 2) in the case of the equation 1 succeeds the combination to a closed curve thus that the reciprocal value of the temperature gradient (D theta/dt)<-1 > over the auxiliary variable is laid on meff = mHÒ + 0,35.mwaesch. In the case of the equation 2 not the conductance G over the wassermasse is laid on, but the auxiliary variable G.mwaesch. Also here by it a compression of dependence can be reached. The equations 1 and 2 link the measured values for the temperature gradient D theta/dt and the electrical conductance G with the value which can be predicted, in this case with the wassermasse m<H>Ò. They depend additionally however on the dry weight not well-known with the forecast mwaesch. They can be dissolved under elimination of the laundry mass mwaesch after the wassermasse m<H>Ò. The constants of k0. . . k3 depend on the concrete type of machine. Since the drying duration T is linked with the wassermasse during constant processing in first approximation after a linear relationship, now the prospective drying duration Tv can be indicated: Tv = c0 + c1.mHÒ. In it c0 and c1 are likewise machine-dependent constants. It is appropriate generally to adapt the prognosis procedure by comparison of the prognoses Tv with the material adjusting drying lasting Tr. In the simplest case can take place by means of determination of a korrekturfaktors, which is formed with the help of a sliding average value from the relationship Tr/Tv of the last n drying. -



Claims OF DE19939273 1. Procedure for the determination of the prospective running time of a drying procedure in Waeschetrocknern well-known design marked by a continuous temperature collection in the drum in and drum withdrawal and damp drying programs, by the fact that to the more exact determination of the prospective drying duration of a Waeschetrockners as promptly

as possible after the start of the equipment at least two from each other to a large extent independent measured variables, for example to first the electrical resistance/conductance of the laundry at the beginning of the drying process as well as mathematical/physically the sizes derivable from it, for example the electrical tension (Uw) over the laundry resistance, in particular the arithmetic average value (Uw) of this tension as well as to second the temporal temperature gradient at the drum withdrawal of the processing air after switching on of the heating on and the sizes mathematical/physically derivable from it, for example reciprocal value of the temperature rise at the drum exit and Temperature time constant of the system, in particular in addition, Temperaturdifferenz/der temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating on, which maximum Temperaturdifferenz/der maximum temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating on, which temporal temperature rise at the drum withdrawal of the processing air with a given firm temperature difference at the drum entrance after switching on of the heating on and the temperature gradient at the drum withdrawal of the processing air is used with a given firm temperature difference at the drum withdrawal after switching on of the heating on, and set with one another in correlation, whereby each individual measured variable exhibits an ambiguity regarding the drying duration which can be predicted. 2. Procedure according to requirement 1, by the fact characterized that to the consideration of the amount of heat (Pheiz) of the Trockners the temporal temperature gradient at the drum entrance of the processing air after switching on of the heating on as well as the sizes, for example reciprocal value of the temperature rise at the drum entrance, mathematical/physically derivable from it, in particular in addition, Temperaturdifferenz/der temperature rise at the drum entrance of the processing air in a firm period after switching on of the heating, the maximum temperature rise on at the drum entrance of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum entrance of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating, the temperature gradient on at the drum entrance of the processing air with a given firm temperature difference at the drum entrance after switching on on of the Heating, and set with the measured variables according to requirement 1 in correlation is used. 3. Procedure according to requirement 1, by it characterized that A) is eliminated to a large extent for the determination of the prospective drying duration for example the laundry conductance (G) and the temperature gradient (D theta/dt) of the drum output temperature (theta) to be used, of which everyone exhibits an individual ambiguity regarding the drying duration which can be predicted, b) regarding the prospective drying duration the available ambiguity of the measured variables by correction sizes, which depend on the dry weight, C) the dry weight used for the correction of the ambiguity by release from the measured variables, the dry weight, the wassermasse and the test drying duration of the resulting in set of equations eliminates itself, so that an analytic expression for the prognosis of the drying duration results, for that the knowledge of the current dry weight and current wassermasse is not necessary and that as learning algorithm the values are adapted to the material adjusting drying times (Tr) for the prospective drying duration (Tv) by the determination of a korrekturfaktors, which is formed for example from the sliding average value of the relationship material drying duration to prospective drying duration (Tr/Tv). ---------- ---------- DATA supplied from the DATA cousin esp@cenet - Worldwide

Description OF DE19939271 the invention concerns a procedure for determining the prospective drying time in Abluftwaeschetrocknern well-known design with a continuous temperature collection at the drum in and drum withdrawal and a humidity-dependent control. As well known the ideal process cycle of the drying procedure and thus the drying duration of the laundry in a household laundry dryer are determined predominantly by the characteristics of quantity, initial at the beginning of the loading, kind of textile of the loading and device-specific characteristic data of the Trockners, among other things the amount of heat, as well as the condition of the ambient air, thus air temperature and the relative humidity. These influences affect the trial process of the drying procedure directly and must be seized and evaluated for the determination of the prospective running time of the drying procedure as early as possible after the start of the Trockners. Past procedures for the determination of the drying duration or loading proceed generally from a causal connection only one measured variable to the goal sizes. Thus the system is to be determined under and thus the loading and the drying duration not sufficiently exactly. From the DE 30 30 864 C2 already a procedure for automatic steering of the drying procedure up to reaching a desired drying level is well-known, with which the gradient of the rising temperature is determined during an early phase of the drying procedure and as a function of this the necessary actual working time is calculated. To receive felt with a such procedure it as particularly unfavorably that with the determination of the heat-up speed the temperature difference between laundry drying system and ambient air must be considered, in order representative a result of measurement for the necessary actual working time. If one is limited with the given procedures alone to the determination of the heat-up speed, enviromental influences, as for example the initial test temperature of the laundry, become which does not consider initial test temperature of the laundry dryer system and the ambient temperature, so that an inaccurate current value for the necessary actual working time is given to the program expensive mechanism. In addition an inaccurate value is determined also with line voltage changes, since the heat-up speed is dependent on the amount of heat and the mains voltage enters squarely amount of heat. A further disadvantage consists of the fact that by the heating-up time a relatively late Erstanzeige is made possible, for example after 10 min.. Further is well-known from the DE 40 13 543 A1 to determine the remaining duration of a drying procedure after reaching a given target temperature as a function of the cooling speed in the drying system. Here also the disadvantages exist that the announcement of the duration only at a relatively late time after switching on of the equipment on and are not considered mains voltage tolerances take place. From the DE 44 42 250 A1 a procedure for determining the prospective drying time is in a laundry dryer well-known, with which for as error free a determining of the drying time as possible independently of external influences, for example variable ambient temperatures, is intended, during drying a part or the entire heating mechanism periodically switch on and off, the differences: to determine on the one hand between the exhaust air and the supply air temperature and on the other hand between the exhaust air temperature and the air temperature before entrance into the heating mechanism from periodically measured temperature levels at the indicated places and set to each other in relationship. The verhaeltniswerte are compared with empirical values, in order to close on the respective applicable drying duration. The expenditure of computer achievements, necessary with this control procedure, is however substantial. In addition thereby the large spread of the temperature measured values can be only partially limited. Therefore the forecast of the prospective drying duration is accordingly inaccurate. Further a procedure for the residual moisture control of a Waeschetrockners is using a conductance-dependent humidity meter circuit admits become from the DE 34 17 482 A1, with

which during that approximately conductance-constant drying phase in the humidity meter circuit the tension resting presently/immediately against the laundry resistance is measured as indicator for the available conductance of the water bound in the laundry and/or as indicator for the respective loading quantity and/or kind of laundry and supplied to a correction stage. In the correction stage the comparison of the momentary value with empirically determined and in a memory of the correction stage takes place put down reference values. In dependence of this comparison those the preselected residual moisture content adapted cutoff voltage is adjusted in each case for the completion of the drying time. Also with this procedure no sufficiently exact regulation is made possible for the drying duration, since changing messbedingungen, for example the change of the water quality, to recognize each other and process not let. Finally a procedure for the determination and announcement of the running time of a drying procedure is well-known with a program controlled laundry dryer to make with over the user as exact an overview as possible possible over the time of the prospective end of a drying program running off from the DE 197 05 585 A1 by an accumulation of dry-degree-dependent current values put down by in the program expensive mechanism for different drying programs a first estimated value is calculated for the program execution time of the selected drying program and brought to the announcement. Also this procedure does not permit determination of a sufficiently exact forecast of the drying duration. The used measured variables for the determination and announcement of the running time of a drying procedure are so far either the electrical resistance and/or the electrical conductance of the laundry or the temporal temperature gradient in the dryer, the kind of textile thereby by the user by adjusting at the control elements are given. The determination of the forecast of the drying duration however in particular the missing sizes become quantity and dampness of the loading with the exhaust air laundry dryer, which generally unsettled amount of heat Pheiz &tilde& U<2>netz as well as the condition of the ambient air needs. The invention is the basis the task to determine as well as the conditions effect affect the measured variables consider the necessary drying time of the laundry in Abluftwaeschetrocknern substantially more exactly than so far, for example the ambient temperature do and/or the amount of heat of the Trockners. The solution of this task is obtained by the characteristics marked in the principal claim. The advantage of the ending-in accordance with-eaten procedure is to be seen in particular in the fact that a more exact regulation is made possible for the loading and the drying duration briefly after the start and a better adjustment to the available in each case conditions. At least three actually well-known, to a large extent independent measured variables become according to invention, for example the more exact determination of the drying duration of a Abluftwaeschetrockners as promptly as possible after the start of the equipment: to first the electrical resistance/conductance of the laundry at the beginning of the drying process as well as mathematical/physically the sizes, for example the electrical tension Uw over the laundry resistance, in particular the arithmetic average value Uw of this tension Uw, to second the temporal temperature gradient at the drum withdrawal of the processing air after switching on of the heating on as well as the sizes, for example the reciprocal value of the temperature rise and the temperature time constant of the system, mathematical/physically derivable from it, in particular in addition, Temperaturdifferenz/der temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating, derivable from it, maximum Temperaturdifferenz/der on maximum temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum withdrawal of the processing air with a given firm To temperature difference at the drum entrance after switching on of the heating, the

temperature gradient on at the drum withdrawal of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating on, and to third for the consideration of the ambient temperature do the middle temperature at the drum entrance at the beginning of the drying process or the middle temperature at the drum withdrawal at the beginning of the drying process before switching on of the heating on or the middle temperature at the air inlet of the Trockners, used and with one another in correlation set, so that a substantially improved drying continuous estimation tprognose results. The moreover for the optional consideration of the amount of heat (Pheiz) of the Trockners the temporal temperature gradient at the drum entrance of the processing air after switching on of the heating on as well as the sizes, for example the reciprocal value of the temperature rise at the drum entrance, mathematical/physically derivable from it, are used in particular in addition, Temperaturdifferenz/der temperature rise at the drum entrance of the processing air in a firm period after switching on of the heating, the maximum temperature rise on at the drum entrance of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum entrance of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating, the temperature gradient on at the drum entrance of the processing air with a given firm temperature difference at the drum entrance after switching on of the heating on, and with the measured variables in correlation, specified before, set. The procedure according to invention concerns mentioned just as above measured variables, if they are subjected with a similar or digital filter. According to invention the forecast accuracy of the drying duration substantially improved with the procedure arises as a result of the fact that n measured variables are brought with one another at least according to it the contained physical connections to the n main measured variables in relationship. ---------- ---------- DATA supplied from the DATA cousin esp@cenet - Worldwide

Claims OF DE19939271 1. Procedure for the determination of the prospective drying time of a drying procedure in Abluftwaeschetrocknern well-known design marked by a continuous temperature collection in the drum in and drum withdrawal and damp drying programs, by the fact that to the more exact determination of the prospective drying duration of a Abluftwaeschetrockners as promptly as possible after the start of the equipment at least three from each other to a large extent independent measured variables, for example to first the electrical resistance/conductance of the laundry at the beginning of the drying process as well as mathematical/physically the sizes derivable from it, for example the electrical tension (Uw) over the laundry resistance, in particular the arithmetic average value (Uw) of this tension, to second the temporal temperature gradient at the drum withdrawal of the processing air after switching on of the heating on and the sizes mathematical/physically derivable from it, for example reciprocal value of the temperature rise at the drum exit and Temperature time constant of the system, in particular in addition, Temperaturdifferenz/der temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating, maximum Temperaturdifferenz/der on maximum temperature rise at the drum withdrawal of the processing air in a firm period after switching on of the heating on, the temporal temperature rise at the drum withdrawal of the processing air with a given firm temperature difference at the drum entrance after switching on of the heating on and the temperature gradient at the drum withdrawal of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating on, as well as to third for the consideration of the ambient temperature (do) the middle temperature at the drum entrance at the beginning of the drying

process or the middle temperature at the drum withdrawal at the beginning of the drying process before switching on of the heating on or the middle temperature at the air inlet of the Trockners, to be used and in correlation set with one another, whereby each measured variable for itself is ambiguous regarding the drying duration which can be predicted, 2. Procedure according to requirement 1, by the fact characterized that to the consideration of the amount of heat (Pheiz) of the Trockners for example the temporal temperature gradient at the drum entrance of the processing air after switching on of the heating on as well as the sizes, for example the reciprocal value of the temperature rise at the drum entrance, mathematical/physically derivable from it, in particular in addition, Temperaturdifferenz/der temperature rise at the drum entrance of the processing air in a firm period after switching on of the heating, the maximum temperature rise on at the drum entrance of the processing air in a firm period after switching on of the heating, the temporal temperature rise on at the drum entrance of the processing air with a given firm temperature difference at the drum withdrawal after switching on of the heating, the temperature gradient on at the drum entrance of the processing air with a given firm temperature difference at the drum entrance after switching on on the heating, one uses and one sets with the measured variables according to requirement 1 in correlation. ---------- ---------- DATA supplied from the DATA cousin esp@cenet - Worldwide